Duquesne Law Review

Volume 17 | Number 1 Article 11

1978

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Patrick C. McGinley

Thomas J. Sweet

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*Patrick C. McGinley**
and
*Thomas J. Sweet***

I. INTRODUCTION

For decades the United States has hurtled headlong into oil and natural gas fueled industrialization. Abruptly in 1973, with the Arab oil embargo, most Americans learned for the first time that their petroleum based economy was grounded on a less than stable foundation. Government officials acknowledged that severe oil and natural gas shortages were likely to occur by the end of the twentieth century. In response to the spectre of developing crisis the newly elected President Carter announced that the nation would immediately seek to discover and conserve domestic petroleum and natural gas, reduce foreign oil imports, and develop alternative energy sources.

A cornerstone of the Carter Administration's energy program is the use of the country's extremely large bituminous coal reserves as a primary fuel source. The professed intent is to increase by two thirds the United States' annual coal production by 1985.[1] The President recognized that such a precipitant increase in coal utilization brings with it attendant environmental hazards, a danger which he indicated could be avoided.

To appreciate the potential environmental hazards of increased coal utilization it is important to view the entire coal fuel cycle, that is, all of the processes included in converting coal from underground deposits to useful energy. The basic components of this cycle can be viewed as extraction, processing and transportation, combustion or conversion, and waste disposal. Each of these fuel cycle compo-

* A.B., Dickinson College; J.D., Duke University. The author is an Associate Professor of Law, West Virginia University College of Law.

** B.A., S.U.N.Y., Binghamton, New York; J.D., West Virginia University College of Law. The author is a Research Associate at West Virginia University College of Law.

1. EXECUTIVE OFFICE OF THE PRESIDENT, ENERGY POLICY AND PLANNING, THE NATIONAL ENERGY PLAN, XIII (April 29, 1977).

nents has associated environmental hazards. Taken together the coal fuel cycle has an impact on air quality, water quality, land quality, and plant and animal life. Although there is extensive federal, state and local regulation of various aspects of the environmental impact of coal utilization,[2] it is not clear that the regulatory format is adequate to avoid the dangers as handily as the President suggests, due to both the unknown aspects of some of these hazards and the economic tradeoffs required by adequate controls.

The adverse air effects of coal utilization arise primarily from the combustion or conversion processes which emit sulfur dioxides, particulate matter, and nitrogen oxides. These emissions in turn effect water and land quality as they settle from the air either in the form of acid rain or various particulates including sulfates and radionuclides.

The major method of accomplishing increased coal conversion to useful energy will be by steam electric generating plants. These facilities will represent the major air pollution source for many parts of the nation. Moreover, due to the inherent thermal inefficiency of this means of energy conversion, tremendous amounts of waste heat must be dissipated from such facilities. Although various proposals have been made to utilize this waste heat in agriculture or aquaculture or for space heating, most of it is discharged to bodies of water where it can have adverse effects upon fish and other aquatic life.

This solid waste associated with the coal fuel cycle requires significant land utilization for disposal. These wastes are generated from the extraction and processing of coal, from combustion in the form of ash, and as sludges from various pollution control devices.

The effects of coal utilization on water occur at various points in the fuel cycle but the most significant are those associated with the extraction of coal. This article discusses these impacts with a particular focus upon the problem of acid mine drainage.

Perhaps the most serious environmental problem related to the mining of bituminous coal is the production of this ecologically damaging acid mine drainage (AMD) from deep and surface mines.[3] The problem is largely confined to the coal fields of the East, partic-

2. *See, e.g.*, Clean Air Act, 42 U.S.C.A. § 7401 (Supp. 1978), Clean Water Act (Federal Water Pollution Control Act), 33 U.S.C.A. § 1251 (Supp. 1978), Surface Mining Control and Reclamation Act of 1977, 30 U.S.C.A. § 1210 (Supp. 1978).

3. Begley & Williams, *Coal Mine Water Pollution: an Acid Problem With Murky Solutions*, 64 KY. L. REV. 507, 511 (1976).

ularly Appalachia.

AMD results when acid sulfide minerals, principally iron pyrites contained in the overburden of coal seams, are exposed to air and water during and after mining. Such exposure, which may take place in either deep or surface mines, triggers a chemical reaction that produces an effluent which, when discharged into surface waters, contains sulfuric acid, sulfates, iron hydroxides and such dissolved minerals as aluminum, calcium, magnesium, manganese, and ferrous iron. The gravity of an AMD problem at a given mine is the product of the amount and type of pyrite present in the overburden, the length of time the pyrite is exposed, other characteristics of the overburden, and the amount of water contacting the pyritic material.[4] The most readily noticible product of AMD is the orangish material (iron hydroxide) often referred to as "yellow boy" which precipitates out of the mine effluent and coats streambeds.[5]

AMD problems are not of recent origin, having first been observed by early settlers as a natural phenomenon occuring in Appalachia almost 300 years ago.[6] As coal mining accelerated at the end of the nineteenth and the first three quarters of the twentieth century its adverse effects have multiplied. Billions of gallons of acid mine drainage entering Appalachian streams impair municipal water supplies and increase the cost of drinking water treatment. Industrial water users must choose between expensive water treatment or higher equipment maintenance costs and reduced equipment life as a result of the corrosive effects of AMD.[7] Fish and other aquatic life are killed or decimated.[8] Dams, piers, bridges, barges, boats and the like are damaged by AMD corrosion. The orange-streambeds of Appalachia have destroyed the recreation potential of many areas which would otherwise be extremely appealing to the outdoor person and tourist. One commentator has forcefully stated that "[n]owhere is the human cost of water pollution more appar-

4. *Id.* at 510-11.

5. Broughton, Koza & Selway, *Acid Mine Drainage and The Pennsylvania Courts*, 11 DUQ. L. REV. 495, 496-498 (1973) [hereinafter cited as Broughton].

6. ALDERMAN & SMITH, ACID MINE DRAINAGE: THE PROBLEM AND THE SOLUTION: COAL MINING AND PROCESSING 66 (August, 1977). H. EAVENSON, THE FIRST CENTURY AND A QUARTER OF AMERICAN COAL INDUSTRY (1942). E. CLEARY, THE ORSANCO STORY 173 (1967) [hereinafter cited as ORSANCO STORY].

7. Begley & Williams, *supra* note 3, at 511; Broughton, *supra* note 5, at 499.

8. J. BOCCARDY & W. SPAULDING, U.S. DEPARTMENT OF THE INTERIOR, EFFECTS OF SURFACE MINING ON FISH AND WILDLIFE IN APPALACHIA 20 (Bureau of Sport Fisheries and Wildlife, Resorce Pub. No. 65, 1968). Broughton, *supra* note 5, at 499.

ent than along the banks of the red, silt-choked streams of the Appalachian coal fields."[9] Over a decade ago, government studies indicated that 10,500 miles of water ways and a majority of the major streams in the Appalachian coal region were appreciably influenced by AMD;[10] figures which certainly have increased since that time. A 1969 estimate calculated that it would cost more than six billion dollars to abate AMD pollution.[11] It has been reported that underground (deep) coal mines produce 71.3% of all AMD, although they constitute only 58% of the number of individual sources.[12] Inactive or abandoned deep mines constitute 53% of the sources and contribute to 52.5% of total AMD. Active underground mines contribute 18.8% of total AMD although they amount to only 5% of total pollution sources.[13] A 1968 study of AMD in Pennsylvania estimated that approximately 1.5 billion gallons of AMD was discharged each day into that state's streams, one billion gallons of which was generated in inactive or abandoned coal mines.[14]

Perhaps the most appalling feature of AMD is that as long as pyritic material is exposed to air and water, pollution of ground water and gravity discharges to and pollution of surface water will continue long after mining closes—a period which could extend over many centuries.

II. Initial Judicial Response To Acid Mine Drainage Pollution

It is axiomatic in water law that when a stream passes through his property a lower riparian owner has the right to receive its waters undiminished in quantity and unimpaired in quality, except insofar as it is effected by the ordinary and reasonable use of upstream riparian owners.[15] Applying this well established authority to dis-

9. Begley & Williams, *supra* note 3, at 512.

10. *Id.* at 512 (citing U.S. Dept. of Interior, Environmental Effects of Underground Mining and Mineral Processing 97 (Jan. 29, 1971)) (unpublished working paper); Appalachian Regional Comm., Acid Mine Drainage in Appalachia 6 (1969) [hereinafter cited as App. Reg. Comm.]; *see* therein U.S. Army Corps of Eng., *The Incidence and Formation of Mine Drainage Pollution in Appalachia*, app. C, which contains detailed river basin by river basin study.

11. Begley & Williams, *supra* note 3, at 512; J. Stacks, Stripping 71 (1972); App. Reg. Comm., *supra* note 10, at 36, 41. *See also* Broughton, *supra* note 5, at 498.

12. *See* note 3 *supra*, J. Stacks, supra note 11, at 71.

13. *See* note 3 *supra*.

14. Charmbury, Buscavage & Manevil, *Pennsylvania's Abandoned Mine Drainage Pollution Abatement Program*, in Second Symposium on Coal Mine Drainage Research 319 (1968).

15. 1 Waters & Water Rights § 51.2, at 289 (R. E. Clark ed. 1967).

charges of AMD, one might logically expect to find many cases where injunctive decrees and awards of damages were granted against mine operators.

However, such precedent is not to be found. An analysis of the early AMD cases suggests a judicial acceptance of the inevitability of such pollution at a time when a practical and economically feasible method of treatment or abatement was not believed to exist. Moreover, courts seemed to pay great deference to the important contribution of the coal mining industry to the economy of their region. Particularly noteworthy is the 1886 decision of the Supreme Court of Pennsylvania, *Pennsylvania Coal Co. v. Sanderson.*[16] In *Sanderson* a lower riparian owner brought a trespass action against a coal company for discharging AMD into a stream. The discharge of AMD from the company's upstream mine rendered the water in the stream unfit for the plaintiff's domestic use and destroyed all fish and aquatic life therein. In reversing a judgment for the plaintiff the Pennsylvania Court said:

> The right to mine coal . . . is a right incident to the ownership of the coal property; and when exercised in the ordinary manner, and with due care, the owner cannot be held for permitting the natural flow of mine water over his own land, into the watercourse, . . . The discharge of this acidulated water is practically a condition upon which the ordinary use and enjoyment of coal lands depends.
>
> We are of opinion that mere private personal inconveniences, arising in this way . . . must yield to the necessities of a great public industry, which, . . . subserves a great public interest. To encourage the development of the great natural resources of a country trifling inconveniences to particular persons must sometimes give way to the necessities of a great community.[17]

Sanderson represents the highwater mark of judicial sympathy for the coal industry's AMD problem. Twenty-five years later the Pennsylvania Court reflected on the effects of the case: "The exception introduced in the Sanderson Case has resulted in the pollution of nearly every stream in the western end of the state, and it has become a serious problem how to obtain pure water sufficient to

16. 113 Pa. 126, 6 A. 453 (1886).
17. *Id.* at 146, 149, 6 A. at 457, 459.

supply the inhabitants."[18]

Although this case has been distinguished or rejected in most jurisdictions,[19] it was not overruled in Pennsylvania until 1974.[20] *Sanderson* was generally distinguished as having concerned the natural gravity discharge of AMD into water courses. Most courts held that if the mine operator altered natural gravitational discharges, by pumping, excavating drainage ditches, laying discharge pipes or any other method which would cause AMD to flow in a direction or volume different than its natural propensity, a cause of action would accrue to the lower riparian owner.[21] Most courts also rejected the coal operators' contentions that they possessed prescriptive rights to discharge AMD as against downstream water users.[22]

While it is true that some plaintiffs successfully sought injunctive relief to abate the discharge of AMD,[23] or were granted monetary awards for damages suffered as a result of AMD pollution,[24] such remedies were severely restricted by the courts. While the courts generally rejected the *Sanderson* approach, they did recognize limits on liability of the coal operator.

The cases limit liability to situations where ordinary care and

18. McCune v. Pittsburgh & Baltimore Coal Co., 238 Pa. 83, 93, 85 A. 1102, 1106 (1913).

19. *See, e.g.*, Beaver Dam Co. v. Daniel, 227 Ky. 423, 13 S.W.2d 254 (1929); Beach v. Sterling Iron & Zinc Co., 54 N.J. 63, 33 A. 286 (1895); Iron Co. v. Tucker, 48 Ohio St. 41, 26 N.E. 630 (1891); Pennsylvania R.R. v. Sagamore Coal Co., 281 Pa. 233, 126 A. 386 (1924); McCune v. Pittsburgh & Baltimore Coal Co., 238 Pa. 83, 85 A. 1102 (1913); H.B. Bowling Coal Co. v. Ruffner, 117 Tenn. 180, 100 S.W. 116 (1907); Arminius Chemical Co. v. Landrum, 113 Va. 7, 73 S.E. 459 (1912); Day v. Louisville Coal & Coke Co., 60 W. Va. 27, 53 S.E. 776 (1906). English cases also rejected the holding of *Sanderson*. *See, e.g.*, Pennington v. Coal Co., 5 Ch. Div. 769 (1877); Young v. Distillery Co., App. Cas. 691 (1893). *But see* Oakwood Smokeless Coal Corp. v. Meadows, 184 Va. 168, 34 S.E.2d 392 (1945).

20. Commonwealth v. Barnes & Tucker Company, 455 Pa. 392, 319 A.2d 871, 881 (1974).

21. *See, e.g.*, cases cited in note 18 *supra*.

22. Stouts Mountain Coal & Coke Co. v. Ballard, 195 Ala. 283, 70 So. 172 (1915); W.G. Duncan Coal Co. v. Jones, 254 S.W.2d 720 (Ky. 1953). In *Jones* the court did recognize the possibility of a prescriptive right to discharge but insisted that the discharge must meet the usual requirements of open, notorious use adverse to claim of right for a prescriptive period (ten years in Kentucky).

23. *See, e.g.*, Commonwealth *ex rel.* Chidsey v. Black, 363 Pa. 231, 69 A.2d 376 (1949); Pennsylvania R. Co. v. Sagamore Coal Co., 281 Pa. 233, 126 A. 386 (1924); McCune v. Pittsburgh & Baltimore Coal Co., 238 Pa. 83, 85 A. 1102 (1913). *But see* Glenn v. Crescent Coal Co., 145 Ky. 137, 140 S.W. 43 (1911) (plaintiff had to mitigate or minimize damages).

24. *See, e.g.*, H.B. Bowling Coal Co. v. Ruffner, 117 Tenn. 180, 100 S.W. 116 (1907); Day v. Louisville Coal & Coke Co., 60 W. Va. 27, 53 S.E. 776 (1906). *But see* Panther Coal Co. v. Looney, 185 Va. 758, 40 S.E.2d 298 (1946) (damages denied as too speculative and lacking causal connection).

expenditure of reasonable expense will abate AMD pollution.[25] As a practical matter, in many situations complete abatement or treatment was prohibitively expensive or impossible because of technological limitations—the absence of effective or economically viable treatment techniques. Relief was usually limited to cases where the operator could have discharged into a watershed where there were no complaining riparians—a situation which was not unusual in the rural areas where coal mines are generally located. Moreover, the generally rural setting of coal mining operations must often have so isolated an AMD discharge as to make its effect *de minimus,* on adjacent unpopulated forest, field, and streams. The showing of actual damages, of course, was a prerequisite to recovery.

The plaintiff's evidentiary burden of showing that AMD caused certain damage to his stream, well, or spring also created barriers to legal remedies for AMD injuries; for a watershed where several coal mining operations might discharge AMD into surface and groundwaters, expert testimony is often required to establish causation. Even if a plaintiff could afford an aquatic biologist, a mining engineer and a geohydrologist, the legal burden of proving causation is a heavy one.

Coal operators themselves have long sought to escape liability for AMD discharges by attaching broad exculpatory clauses to coal grants and leases. Typical of these are the provisions in a 1940 Kentucky deed. In *Inland Steel Co. v. Isaacs*[26] the coal grantee was granted "the right to use, divert, dam, and pollute watercourses thereon in any and every manner" consistent with necessary mining practices. The deed also gave the grantee "the right to dump, store, and leave upon, said land any and all bone, shale, water or other refuse" related to mining activities.

Perhaps the most important reason why legal remedies have had little effect on the spread of AMD pollution to thousands of miles

25. *See, e.g.,* Stouts Mountain Coal & Coke Co. v. Ballard, 195 Ala. 283, 70 So. 172 (1915); Pratt Consol. Coal Co. v. Morton, 14 Ala. 194, 68 So. 1015 (Ct. App. 1915); West Kentucky Coal Co. v. Rudd, 328 S.W.2d 156 (Ky. 1959); Beaver Dam Coal Co. v. Daniel, 227 Ky. 423, 13 S.W.2d 254 (1929); Eaton v. Green River Coal & Coke Co., 157 Ky. 159, 162 S.W. 807 (1914); Nebo Consol. Coal & Coking Co. v. Lynch, 141 Ky. 711, 133 S.W. 763 (1911); Columbus & H Coal & Iron Co. v. Tucker, 48 Ohio St. 41, 26 N.E. 630 (1891); The Standard Hocking Coal Co. v. Rooltz, 5 Ohio App. 84 (1915); Bumbarger v. Walker, 393 Pa. 143, 142 A.2d 171 (1958); H. B. Bowling Co. v. Ruffner, 117 Tenn. 180, 100 S.W. 116 (1907); Panther Coal Co. v. Looney, 185 Va. 758, 40 S.E. 2d 298 (1946); Day v. Louisville Coal & Coke Co., 60 W.Va. 27, 53 S.E. 776 (1906).

26. 283 Ky. 770, 143 S.W.2d 503 (1940).

of Appalachian streams is simply that the law placed no liability on mine operators for post-mining discharges. Once a mine shut down, AMD would flow out of the portals by gravity and enter and pollute nearby streams. It is reasonable to conclude that courts simply accepted the premise that there was no effective way to abate post-mining discharges and that any attempt to place liability for abatement on the operator would be to attach an impossible burden which would destroy the coal industry.[27] However, advancing technology offers significant hope that post-mining discharges can be controlled and abated.

It could be argued that the failure of the courts to impose effective restraints on coal operators for AMD pollution during and after mining created a situation where the coal industry lacked substantial incentive to develop new abatement technologies. It has only been since the enactment of the Federal Water Pollution Control Act and the vigorous enforcement of state environmental protection laws that great strides have been made in developing and applying effective AMD abatement technology. Thus, it is in this context that strict but even-handed enforcement of the WPCA and the new Federal Surface Mining and Reclamation Act is a necessity if AMD pollution is to be effectively controlled. The history of AMD pollution makes it quite evident that the coal industry cannot or will not solve the problem without governmental and judicial encouragement.

III. AMD Treatment, Control and Abatement

As coal mining increased and AMD from active and abandoned coal mines caused growing economic, ecologic and aesthetic damage in the Appalachian region, public sentiment to curtail such pollution grew. Both government and industry sought means of abatement. One of the earliest remedial proposals involved neutralization of mine acid by treatment with lime or limestone.[28] The coal industry, however, rejected lime neutralization as an effective means of treatment. It asserted that the cost was prohibitive and nonpolluting disposal of sludge generated by neutralization would be as difficult as dealing with AMD itself, a position supported by some

27. *See* discussion of early industry claims that feasible control technology did not exist accompanying notes 30-31 *infra*.

28. Orsanco Story, *supra* note 5, at 173.

non-industry experts.[29] Thus a spokesman for the National Coal Association stated with conviction during Congressional hearings in 1936 that: "in the light of present knowledge there is no known satisfactory method of treating mine drainage. Under these circumstances, any legislation would be unwise, would result in confusion, unnecessary expense and would do no good."[30]

It has been observed that the early efforts to promote statutory regulation of AMD

> reflect a dismal record of frustration and ineffectiveness. In regions whose livelihood depended on coal mining there were many influences that denied any hindrance to such activity. Thus when proposals were introduced in state legislatures to strengthen anti-pollution measures an exemption would inevitably be granted concerning mine drainage until such times as "practical means" were available to deal with it.[31]

While the development and acceptance of control technology to deal with AMD from both surface and deep mines has taken decades, there is presently no doubt that it has now reached a stage where AMD can be effectively treated by chemical means and its discharge to surface waters reduced or eliminated by accepted mining and reclamation techniques.[32]

Such control technology includes techniques employed before,

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29. *Id. See Acid Mine Drainage From Bituminous Mines,* Research Bull. No. 10, Engineering Experiment Station, W. Va. Univ. (1933).

30. *Orsanco Story, supra* note 5, at 196. *See also, Hearings Before a Subcommittee of the Com. on Commerce,* U.S. Senate, 74th Cong., 2d Sess., 192-97 (1936).

31. ORSANCO STORY, *supra* note 5, at 171. Typical legislative deference to the coal industry was the proviso contained in section 301 of the Pennsylvania Clean Streams Act of 1937, "The provisions of this article shall not apply until such time, as in the opinion of the Sanitary Water Board, practical means for removal of the polluting properties of such drainage shall become known." The method of treatment of acid mine drainage, which was rejected by state legislatures and the coal industry in the 1930's, is essentially the same as that widely used by coal operators today. *See* discussion accompanying note 37 *infra.* It is also interesting to note that in 1955 the eight signatory states of the Ohio River Valley Water Sanitation Compact ["ORSANCO"] (Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia) adopted minimum industrial waste control requirements which were to be applied to all industrial discharges *except AMD.* "It was not until 1960—after the engineering committee of ORSANCO asserted that the possibilities for control were not as hopeless as had been portrayed—that the commissioners found justification for removing and [AMD] exemption . . . ." ORSANCO STORY, *supra* note 5, at 171.

32. *See, e.g., Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Coal Mining Point Source Category,* U.S. Env. Protection Agency (1976) [hereinafter cited as *Development Document*].

during and after coal mining.[33] Different control technology to ameliorate AMD exists for deep and surface mines, but it is waste water treatment that is common to both.

A. *AMD Control Technology for Surface Mines*

Currently acceptable surface mine pollution control technology is divided into two major categories—specific mining techniques and at-source reclamation technology. Surface mining techniques can effectively reduce amounts of pollutants exiting a mine either by containing them within the mine or by reducing their formation.[34] Regrading, erosion control and revegetation are reclamation methods which allow for the effective burying of mining exposed pyrites, and overburden, which causes AMD when contact is made with air and water. Contour regrading is suitable for, and is currently used, in many areas to return the strip-mined land to its approximate original contour. This technique is relatively effective in reducing AMD and is desirable because it eliminates aesthetically displeasing "high-walls" which have blighted much of the Appalachian coal region.[35] Even when mining techniques, regrading, erosion control and revegetation are employed, a waste water treatment plant may be necessary to treat unacceptable AMD effluent.

B. *AMD Control Technology for Deep Mines*

Deep mining control technology may also be divided into mining techniques and effluent treatment technology. Mining techniques are directed toward reducing the amount of water that may infiltrate vertically into underground mine workings through overlying rock strata. According to EPA:

> The only actual underground mining technique developed specifically for pollution control is pre-planned flooding. The tech-

33. There are, of course, pollution problems attendant to coal mining that are not a result of AMD formation and discharge. These problems include soil erosion and sedimentation from surface mined areas and coal preparation and refuse areas; iron, suspended solids and pH may be problems for deep and surface mines in Southern Appalachia and the Midwest, and for surface mines for the Northern Great Plains and West where alkaline mine drainage exists. This article, however, deals primarily with pollution problems related to production and discharge of AMD.

34. *Development Document, supra* note 32, at 73.

35. The Federal Surface Mining Control and Reclamation Act of 1977, requires regrading to original contour in most circumstances. 30 U.S.C.A. § 1265 (Supp. 1978).

> nique is primarily one of mine design, in which a mine is planned from its inception for post-operation flooding or zero discharge. In drift mines and shallow slope or shaft mines this is generally achieved by driving the mine [excavating tunnels] exclusively [downward] to the dip and pumping out all water that collects in the workings. Upon completion of mining activities, the workings are allowed to flood naturally, eliminating the acid producing pyrite-oxygen contact . . . Discharges, if any, from a flooded mine should contain a much lower pollutant concentration.[36]

Mine drainage treatment methods employed to abate AMD from deep mines is identical to that used by surface mining operations. The conventional neutralization technique, which was rejected a half-century ago as a cost-effective method of abatement, is now the method most frequently used by coal operators. It involves using lime, quick lime, or sometimes other alkalis. Such conventional treatment plants usually have facilities for (1) flow equalization, (2) acidity neutralization, (3) ferrous iron oxidation, and (4) solids removal.[37]

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36. *Development Document, supra* note 32, at 91-92. *See also* Mentz & Warg, *Up-Dip Versus Down Dip Mining, an Evaluation,* (EPA Report No., EPA 670/2-75-047, 1975). Preplanned flooding of this type is referred to as "down-dip" mining because mines are developed from the surface at a downward rather than upward angle. Upward or "up-dip" developed mines drain water to the surface by gravity while down-dip mines fill up with water causing no gravity discharge. Section 516 of the Federal Surface Mining Control and Reclamation Act of 1977 prohibits gravity discharges from deep mines, and thus implicitly requires use of down-dip mining technology. 30 U.S.C.A. § 1266.

37. *Development Document, supra* note 32, at 97-98. These facilities may be described as follows:

(1) *Flow equalization.* Surface holding ponds or underground sumps are employed to equalize the flow and quality of AMD before treatment. These facilities usually have the capacity to provide for one or more day's storage in case of treatment plant shutdown. Surface ponds also provide a constant head for gravity flow through the treatment plant which is located below the ponds.

(2) *Acidity Neutralization.* Mineral acidity in raw mine drainage is neutralized by addition of lime, quick lime, or other alkali. In addition, to neutralizing acidity the alkalis also enhance the removal of iron, manganese, and other soluable metals through the formation of their insoluable hydroxides which will precipitate out of AMD during the solids removal state.

(3) *Iron Oxidation.* When iron is present in raw drainage in the ferrous iron form the usual practice is to provide aeration facilities for oxidation to the ferric state. Ferric iron is more insoluable than ferrous iron and thus will precipitate out more readily.

(4) *Solids Removal.* As a result of the chemical treatment process, suspended solids are formed. Both earthen basins and mechanical clarifiers are used for removal of these suspended solids. Earthen impoundments with detentions of from one day to as much

IV. Federal Statutory Regulation Of AMD

With the passage of the 1972 and 1977 Amendments to the Federal Water Pollution Control Act[38] (FWPCA) and the Federal Surface Mining Control and Reclamation Act of 1977 (FSMA),[39] the stage appears finally to be set for an effective uniform national program of regulation and abatement of AMD in the United States. While some federal bureaucrats charged with the task of implementing such a program[40] seem reluctant to affirmatively attack the problem in spite of positive Congressional mandates, it appears that statutory authorization for such action is undeniably present.[41]

A. *Federal Water Pollution Control Act Amendments of 1972*

The 1972 Amendments to the FWPCA boldly state the Congressional policy to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters,"[42] and unequivocally decree that "it is the national goal that the discharge of pollutants into the navigable waters [of the United States] be eliminated by 1985."[43]

The FWPCA is a complex statute which utilizes as a primary enforcement tool a pollution abatement technique called an "effluent limitation".[44] In general terms, an effluent limitation is a technology-based standard requiring designated discharges or

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as several months are most often used. The detentions provided usually are dependent on the precipitate sludge storage capacity desired rather than being a requisite for suspended solids removal.

Development Document, supra note 32, at 98-99.

38. 33 U.S.C.A. § 1251 (Supp. 1978), Pub. L. No. 92-500 *as amended by* Pub. L. No. 93-207, Pub. L. No. 93-243, Pub. L. No. 93-592, Pub. L. No. 94-238, Pub. L. No. 94-558, Pub. L. No. 95-217. The 1972 and 1977 Amendments will be referred to as the FWPCA. Section references will be to Pub. L. Nos. 92-500 and 95-217.

39. Surface Mining Control and Reclamation Act of 1977, 30 U.S.C.A. § 1201 (Supp. 1978).

40. *See* discussion accompanying note 105 *infra* (concerning the U.S. Environmental Protection Agency's failure to apply effluent limitation standards to some types of AMD discharges).

41. *See* discussion at notes 113-119 *infra.*

42. FWPCA § 101(a), 33 U.S.C.A. § 1251(a).

43. FWPCA § 101(a)(1), 33 U.S.C.A. § 1251(a)(1).

44. The term "effluent limitation" is defined by the FWPCA as: "any restriction established by a State or the Administrator on quantities, rates and concentrations of chemical, physical, biological and other constitutents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean, including schedules of compliance." FWPCA § 502(11), 33 U.S.C.A. § 1362(11).

"point sources"[45] to use available means including pollution control devices, operational methods, or manufacturing processes to reduce or eliminate the discharge of "pollutants"[46] into the nation's "navigable waters".[47] An effluent limitation is a numerical standard which describes the amount of pollutants that can be legally released by a point source.[48]

The enforcement mechanism for effluent limitations is a permit system established by the FWPCA named the "National Pollutant Discharge Elimination System" (NPDES).[49] NPDES applies the national effluent limitations guidelines to point source discharges, defines a schedule of implementing the guidelines for each point source, and requires monitoring by each point source discharge.[50]

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45. The term "point source" is defined in the FWPCA as: "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged." FWPCA § 502(14), 33 U.S.C.A. § 1362(14). Discharges from active or abandoned deep mines would almost always fall within the broad definition of point source. Discharges from active deep mines usually come from pipes, ditches, or channels. Discharges from inactive or abandoned mines may come from the same sources or from "discrete fissures" in rock strata. Discharges from surface coal mines may come from any of the above sources. Some question may exist, however, as to whether rain water runoff, which may carry pollutants, is discharged through an identifiable point source. It is doubtful, however, whether rainwater runoff at a surface mine site will cause significant pollution without creating a natural ditch or channel which would convey effluent to a stream and thus fall within the definition of the Act.

46. The term "pollutant" is defined by the FWPCA as "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. FWPCA § 502(6), 33 U.S.C.A. § 1362(6).

47. The term "navigable waters" is defined in the FWPCA as "the waters of the United States, including the territorial seas." FWPCA § 502(7), 33 U.S.C.A. § 1362(7). This term has been broadly interpreted to include all waters subject to the federal government's constitutional authority under the commerce clause. *See, e.g.*, Natural Resources Defense Council, Inc. v. Callaway, 392 F. Supp. 685, 686 (D.D.C. 1975).

48. Effluent standard has been described more specifically as:

> a measure of the amount of a pollutant that is allowed to be discharged in a time period (*e.g.*, 1/10 lb. of mercury a day) or may specify a maximum permissible concentration in the effluent (*e.g.*, no more than .01 parts per million of copper), or may specify a maximum amount that may be discharged per unit of production (*e.g.*, no more than 5 lbs. of suspended solids per ton of paper produced).

R. Zener, *The Federal Law of Water Pollution Control*, in FEDERAL ENVIRONMENTAL LAW 682, 693 (E. Dolgin & T. Guilbert, eds. 1974).

49. FWPCA § 402, 33 U.S.C.A. § 1342.

50. *See generally* R. Zener, *The Federal Law of Water Pollution Control*, in FEDERAL ENVIRONMENTAL LAW 682, 728 (1974); Parentean & Tauman, *The Effluent Limitations Controversy: Will Careless Draftmanship Foil the Objectives of the Federal Water Pollution Control Act Amendments of 1972?*, 6 ECOLOGY L.Q. (1976).

Violation of the terms or conditions of NPDES permits subjects permitees to fine and imprisonment,[51] injunction,[52] permit revocation or suspension,[53] and/or citizen suits.[54] NPDES permits are issued by EPA or by a state if it has been delegated the authority to so act by the agency.[55]

The FWPCA required EPA to promulgate a program of progressively stricter effluent limitations for each category of point sources. To meet these progressively stricter standards, each industry must utilize improved pollution control technology. Thus the 1972 Amendments to the FWPCA required "existing" point source dischargers to adopt the "best practicable control technology currently available" (BPT) by July 1, 1977[56] and the "best available technology economically achievable" (BAT) by July 1, 1983.[57]

The 1977 amendments to the FWPCA have changed these com-

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51. FWPCA § 309(c)(1), 33 U.S.C.A. § 1319(c)(1).

52. *Id.* § 309(b), 33 U.S.C.A. § 1319(b).

53. *Id.* § 402(b)(c), 33 U.S.C.A. § 1341.

54. *Id.* § 505 (a)(1), 33 U.S.C.A. § 1365.

55. *Id.* § 402(b), 33 U.S.C.A. § 1342.

56. FWPCA § 301(b)(1)(A), 33 U.S.C.A. § 1311(b)(1)(A). The BPT standard of 1977 is less stringent than the BAT standard required to be achieved by 1983. The BPT standard has been said to be based on "the average performance of the best existing plants" [or in our case coal mine effluent treatment facility]. *See, e.g.*, American Meat Institute v. EPA, 526 F.2d 442, 453 (7th Cir. 1975); Tanners' Council of America, Inc. v. Train, 540 F.2d 1188, 1191 (4th Cir. 1976). Prof. Rodgers has emphasized that the legislative history of the FWPCA indicates that even for the less stringent of the 1977 BPT, the Administrator of EPA is required to "force technology" up the the point of requiring "higher levels of control than any currently in place." Says Rodgers: "This is not too demanding a concession in light of the historical recognition that an industry wide custom may fail as a defense even in a negligence case because 'a whole new calling may have unduly lagged in the adoption of new and available [pollution abatement] devices.'" RODGERS, HANDBOOK ON ENVIRONMENTAL LAW 464 (1977) [hereinafter cited as RODGERS]. *See* E. I. DuPont de Nemours & Co. v. Train, 541 F.2d 1018, 1031 (4th Cir. 1976), *aff'd* 430 U.S. 112 (1977). *See also, A Legislative History of the Water Pollution Control Act Amendments of 1972,* note 99 *infra,* discussing "technology forcing" and the comments of Senator Muskie, a primary sponsor of the Bill, in 118 CONG. REC. 33,696 (1972) on the same topic.

57. The 1977 Amendments extended the 1983 "BAT" deadline until 1984. 33 U.S.C.A. § 1311. In setting the 1983 BAT standard the EPA Administrator is required by the FWPCA to push for the utilization of technology perhaps not in routine use or in use at all. If industry wide practice is to be considered at all it is only the "best facility" that must set the minimum demands of the 1983 BAT standard. RODGERS, *supra* note 56, at 464-65. Thus the courts have held that BAT required the use of technologies that have not even been demonstrated in a pilot project "as long as the record demonstrates that there is a reasonable basis to believe that the technology will be available by 1983." *Id. See* Tanners' Council of America, Inc. v. Train, 540 F.2d 1188, 1195 (4th Cir. 1976). *See also* E.I. DuPont de Nemours & Co. v. Train, 541 F.2d 1018, 1030 (3d Cir. 1976), *aff'd* 430 U.S. 112 (1977), stating that a cost "balancing" is required for the 1977 but not for the 1983 standard.

pliance dates and altered the requirements for BAT. Under the new scheme, the pollutants discharged by an industrial discharger will be classified as either conventional, nonconventional or toxic. For toxic pollutants the BAT standard is retained, but compliance is not required prior to July 1, 1984, or one year later than the earlier deadline for conventional pollutants, which include biological oxygen demand, fecal coliform and pH; both the compliance date and the standard to be achieved are changed. Dischargers of conventional pollutants must meet a "best conventional control technology" standard which incorporates an economic evaluation based upon the costs of treatment in a municipal treatment facility. Again the compliance date is extended one year to 1984.

Nonconventional pollutants include all pollutants other than toxics or conventionals. The BAT standard is retained for these nonconventional pollutants, but delayed one year or three years after an effluent limitation guideline is promulgated. In no event will standards be in place later than July 1, 1987.

"New" sources are required to meet effluent limitations which require "the greatest degree of effluent reduction . . . achievable through application of the best available demonstrated control technology."[58] Unlike existing sources, new sources are exempted

58. In the context of this article a "new source" would be synonomous to a new coal mine, FWPCA § 306, 33 U.S.C.A. § 1316. A "new source" is therein defined as any source whose construction began after EPA's publication of proposed effluent limitations for that industry. New Source Standards for the Acid or Ferruginous Mine Drainage Subcategory (Mines Generating AMD) were published on September 19, 1977, at 42 Fed. Reg. 46,932. There is some question, however, whether the September 19 date can be considered the activating date for determining whether a coal mining point source is "existing" or "new." Section 306(b)(1)(B) of the FWPCA, 33 U.S.C.A. § 1316 required that new source standards be published within one year of the date that the Administrator of EPA has identified a particular industry as a point source to be regulated. The coal mining point source category was so identified by EPA on October 17, 1975. At least one challenge to an EPA determination that a new coal mine was an existing rather than new source has been made. In W. Va. Highlands Conservancy v. Powellton Co., Civil Docket No. 77-2069 (S.D. W. Va. 1977) construction of a coal mine was proposed but not commenced by October 17, 1976, the date by which new source standards were required by § 306(b)(1)(B) to have been published by EPA. Important distinctions between "new" sources and "existing" sources are grounded not only in the different effluent standards that can be applied to each, but also because the National Environmental Policy Act requirement of an Environmental Impact Statement (EIS) may be triggered by the opening of a new source but not by the operation of an existing source. *See* FWPCA § 511 which exempts EPA from the EIS requirement for all actions except issuance of permits to new sources. 33 U.S.C.A. § 1371. *See also* The National Environmental Policy Act, 42 U.S.C. § 4321 (1970), which requires comprehensive consideration of a broad range of environmental factors when any federal agency proposes "a major federal action significantly affecting the quality of the human environment."

from more stringent standards for ten years or the period of depreciation of the facility, whichever is shorter.[59] Thus, because new sources built in the late 1970's will probably be operating in 1985,[60] the new source standard required serious consideration of a no discharge standard that would meet the Act's 1985 goal.[61] The difference between the BAT existing source standard (1983) and the new source standard has been said to be "that the new source standard should reach farther, require more in the way of extending the frontiers of technology, and accord less sympathy to cost considerations."[62]

Due to inadequate funding, understaffing and an overly ambitious Congressional mandate to develop effluent limitations guidelines for point sources of every kind within one year of the enactment of the FWPCA (by October 18, 1973),[63] effluent limitations guidelines for existing source coal mines were not finally promulgated until April of 1977.[64] Those final guidelines addressed only BPT—that technology and those regulations which were required to be implemented by July 1, 1977.[65]

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59. FWPCA § 306, 33 U.S.C.A. § 1316.

60. Surface coal mines are unlikely to operate for such an extended time.

61. RODGERS, *supra* note 56, at 467.

62. *Id.*

63. FWPCA § 304(b)(1), 33 U.S.C.A. § 1314(b)(1).

64. 42 Fed. Reg. 21,380-90 (1977). National effluent limitations guidelines for the coal mining industry, to be achieved by the application of the "best practicable control technology currently available" (BPT) and "best available technology economically achievable" (BAT) were promulgated by EPA in "interim final" form on May 13, 1976. 40 Fed. Reg. 48,830-35 (1975); 40 Fed. Reg. 19,832-43 (1976). The terms "proposed," "interim final," and "final" regulations are apparently EPA bureaucratic terms of art. Proposed regulations are those published for public comment, but subject to further agency review and change; proposed regulations are not enforceable. Interim final regulations are published for public comment and may subsequently be changed by the agency but are enforceable as though they are final, and can be imposed in agency permits. It is evident that the "interim final" terminology was pressed into use by the agency which was under fire for being two years late in meeting the statutory deadline for promulgation of final regulations. *Cf.* Begley & Williams, *supra* note 3, at 514-25.

65. FWPCA § 301, 33 U.S.C.A. § 1311. EPA declined to promulgate BAT regulations because it "intends to study [the coal] industry extensively with respect to priority water pollutants and the 1983 level of technology. 42 Fed. Reg. 21,380 (1977). These final regulations apply to existing sources and not "new" sources. The regulations set forth separate criteria for three subcategories of point sources: (1) Coal Preparation Plants and Associated Areas; (2) Acid of Ferruginous Mine Drainage; (3) Alkaline Mine Drainage. The focus of this article is on acid drainage problems from mines and thus any reference here to EPA final regulations will refer only to those regulations promulgated for the Acid or Ferruginous Mine Drainage Subcategory.

On September 11, 1977, EPA published proposed new source effluent limitation guidelines for the coal mining point source category.[66] At the date of publication of this article, the public comment period has passed and EPA is expected to publish final new source standards shortly. The parameters of the effluent limitations guidelines for existing sources and new sources are based on control technology outlined above that is currently used by a number of coal operators in some areas.[67]

If there is AMD discharged from an active or reclaimed surface mine or from a deep mine, it is clear that the technology utilized in

66. 42 Fed. Reg. 46,932 (1977). Like the final existing source regulations, the new source regulations apply to those three subcategories of point sources. *See* note 58 *supra*.

67. *Development Document, supra* note 32, at 5. The following table sets forth the existing final and proposed new source effluent limitations guidelines:

Final 1977 Best Practicable Control Technology Currently Available (BPT) For Existing Sources:

PARAMETER	Maximum for any one day (milligrams per liter).	Average of daily values for 30 consecutive days not to exceed (milligrams per liter).
Iron, Total	7.0	3.5
Manganese	4.0	2.0
Total Suspended Solids (TSS)	70.0	35.0
ptt	6.0 to 9.0	—

New Source Performance Standards Applying Best Available Demonstrated Control Technology, Processes, Operating Methods, or other alternatives:

PARAMETER	Maximum for any one day (milligrams per liter).	Average of daily values for 30 consecutive days shall not exceed.
Iron, Total	3.5	3.0
Manganese	4.0	2.0
Total Suspended Solids	70.0	35.0
ph	Within the range 6.0 to 9.0	—

The above proposed New Source Performance Standards would amend Part 434 of Title 40 of C.F.R. by adding § 434.35.

treatment plants[68] as noted above, can be expected to result in the discharge of relatively good quality effluent which will meet existing source BPT and new source requirements, while causing little damage to receiving streams.

B. *Federal Surface Mining and Reclamation Act of 1977*

In August of 1977 President Carter signed into law an Act[69] which for the first time brought surface mining of coal[70] under uniform national reclamation standards. This was an attempt by Congress to mitigate the tremendous environmental and economic harm that unreclaimed strip mining had caused in the coal region as well as eliminate the unfair competitive advantage of coal operators who mine in states where state regulation was nonexistent and reclamation costs correspondingly low.[71]

It is important to note that the Act also pertains to and regulates

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68. In addition to treatment plants, mining and reclamation techniques may also play a very important role in AMD abatement. The BPT effluent limitation criteria were based primarily on the treatment capability of seven "best plants" studied by EPA. Said the agency in its development document:

> All seven plants are located within south-western Pennsylvania and treat drainage from large underground mines. While this may appear biased toward this specific locale, it must be pointed out that Pennsylvania has long been the leader in acid drainage technology . . . . In addition, the larger mines of southwestern Pennsylvania employ the most sophisticated technology in practice today and are most conscientious in their maintainance and operational programs.

Development Document, supra note 32, at 237. While it is clear that Pennsylvania has a relatively effective program of enforcement of its environmental laws against coal mining operations, it is similarly evident that other states in the Appalachian region have inadequate laws and/or enforcement and in those states coal operators are much less conscientious in their maintainance and operational programs. The result of lack of effective state enforcement is, quite naturally, greater harm to water quality by AMD. *See, e.g.*, Begley & Williams, *supra* note 3, at 512-14, 522-25, 531-47; *Center for Science in Public Interest, The Enforcement of Strip Mining Laws in Three Appalachian States: Kentucky, West Virginia, and Pennsylvania.* (CSPI Energy Series VIII, 1975). McGinley, *Prohibition of Surface Mining in West Virginia*, 78 W. VA. L. REV. 445, 448-49 n.43 (1976).

69. Federal Surface Mining Control and Reclamation Act of 1977, 30 U.S.C.A. § 1201-1328 (Supp. 1978) [hereinafter cited as FSMA].

70. The Act also pertains, in part, to mining of other minerals. *See, e.g.*, 30 U.S.C.A. § 1281.

71. There have been many articles describing the damages unregulated strip mining can cause. *See, e.g.*, Stanford Research Institute, *A Study of Surface Coal Mining in West Virginia* (1972), Cardi, *Strip Mining and the 1971 West Virginia Surface Mining and Reclamation Act*, 75 W. VA. L. REV. 319 (1973), Reitze, *Old King Coal and the Merry Rapists of Appalachia*, 22 CASE W. RES. L. REV. 650 (1971), H. CAUDILL, NIGHT COMES TO THE CUMBERLANDS (1963).

the surface effects of underground coal mining operations.[72] Because of the diversity of mining conditions in different areas of the country, the Act places the primary responsibility of its administration on the states.[73] Within six months of enactment a federal enforcement program was to be implemented and is to remain in effect until state programs are approved.[74] States have until January 3, 1979 to submit to the United States Secretary of the Interior a program demonstrating that the state has the capability of carrying out the provisions of the Act and meeting its purposes.[75] If the Secretary, after public comment and hearing, is satisfied that the state program is capable of enforcing the Act, the state will be granted exclusive jurisdiction to regulate surface coal mining operations within its boundaries.[76]

There are a number of provisions of the Act which are of importance in abating or eliminating AMD discharges. Title IV of the Act creates a trust fund known as the Abandoned Mine Reclamation Fund (Fund).[77] Monies for the Fund are to be provided primarily by "reclamation fees" of thirty five cents per ton of surface mined coal, fifteen cents per ton of deep mined coal and the lesser of ten cents per ton or two percent of the value of lignite coal mined in any way.[78] The primary purpose[79] of the Fund is to provide funding for the reclamation and restoration of land and water resources adversely affected by past coal mining including abatement of AMD discharges.[80] Section 407 of the Act provides for the forced reclamation of land as well as the acquisition of land for reclamation purposes by the federal or state governments.[81]

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72. FSMA § 516, 30 U.S.C.A. § 1266.

73. *Id.* § 502, 30 U.S.C.A. § 1252. Regulations were promulgated on December 13, 1977 to implement the "interim" federal enforcement program. 42 Fed. Reg. 62,639 (1977).

74. Congress asserts that its authority to enact such legislation flows from the commerce clause, U.S. CONST. art. I, § 8, in that it attempts to provide uniformity of reclamation standards necessary to prevent unfair competition between coal procedures of differing states.

75. FSMA § 503, 30 U.S.C.A. § 1253.

76. *Id.*

77. *Id.* § 401, 30 U.S.C.A. § 1231.

78. *Id.* § 402, 30 U.S.C.A. § 1232. The Fund will also receive user charges for the use of reclaimed land, donations, and money recovered under any penalty provision of the Act.

79. *Id.* § 401, 30 U.S.C.A. § 1231. The fund may also be used for nine other purposes, including the administrative expenses of the states and the United States and all other necessary expenses to accomplish the purposes of the Act.

80. *Id.* § 407, 30 U.S.C.A. § 1237. The expenditure of Fund monies under this section are chargeable as liens recorded against the land thus reclaimed.

81. *Id.*

The Act also contains provisions for the issuance of permits by the Department of Interior, Office of Surface Mining Reclamation and Enforcement (OSM) or by approved state programs.[82] Permits require detailed technical information concerning mining and reclamation techniques proposed to be used in the mining operation.[83] The regulatory agency, be it state or federal, can review this information and determine whether environmental standards will be complied with, including the avoidance of AMD. Permits issued pursuant to the Act are required to meet very stringent environmental protection standards.[84] Violations of permit conditions can result in permit suspension or revocation,[85] cessation orders,[86] civil[87] and criminal[88] penalties, and injunctive relief.[89]

Section 522 of the Act requires an approved state program to establish a process which will enable the agency to make objective decisions based upon competent and scientifically sound data for designating land areas of the state as unsuitable for all or certain types of surface mining.[90]

Section 516 pertains to surface effects of underground coal mining operations. That section requires the Secretary of Interior to promulgate rules and regulations applicable to underground mining.[91]

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82. *Id.* § 506, 30 U.S.C.A. § 1256.

83. *Id.* § 506-508, 30 U.S.C.A. § 1256-1258; § 510-511, 30 U.S.C.A. § 1260-1261; § 514-516, 30 U.S.C.A. § 1264-1266.

84. *Id.* § 515, 30 U.S.C.A. § 1265.

85. *Id.* § 521, 30 U.S.C.A. § 1271.

86. *Id.*

87. *Id.*

88. *Id.*

89. *Id.* § 520-521, 30 U.S.C.A. § 1270-1271.

90. Section 522 required that such designation be made according to certain standards including:

A. An area will be considered unsuitable for surface mining if reclamation is not economically or technically feasible, 30 U.S.C.A. § 1272(a)(2);

B. An area will be considered unsuitable if:

(1) Mining would be incompatible with existing state or local land use plans, 30 U.S.C.A. § 1272(a)(3)(A),

(2) Mining would affect fragile or historical lands in which such operations could result in significant damage to important historic, cultural, scientific, and ethnic values and natural systems, 30 U.S.C.A. § 1272(a)(3)(B),

(3) Mining would affect long range productivity of water supply or fruit or fiber products and valuable aquifers and aquifers recharge areas, 30 U.S.C.A. § 1272(a)(3)(C),

(4) Mining could create dangers to human health and safety in natural hazard areas with frequent flooding or unstable geology, 30 U.S.C.A. § 1272(a)(3)(D).

91. Such regulations are not to supercede any provisions of the Federal Coal Mine Health

Deep mining operations are required to take steps to control soil erosion and sedimentation from mine portal, refuse disposal, preparation plants, shipping, road, haulage, storage and repair areas. Deep mine operators must grade and revegetate each to prevent degradation of surface and ground waters.

All of these measures can have appreciable effect in reducing AMD discharges. However, the most important provision of Section 516 is, perhaps, that which requires that all new mines working acid or iron producing coal seams to be designed in such a manner as to prevent gravity discharges of water therefrom.[92] Gravity discharges of AMD are, as noted above, the largest source of AMD discharges into the nation's streams. The most distressing feature of such gravity discharges is that as long as a mine contains water and air, the chemical reaction with the coal and pyritic overburden in the mine will create AMD for an indefinite time, perhaps for centuries.

The Act's prohibition of gravity discharges implicitly requires the use of pre-planned flooding techniques of mines driven downward to the dip. When the mine is flooded, air is excluded, thus greatly impeding the AMD creating chemical reaction.

Both the FWPCA and the FSMA provide a means by which advanced AMD treatment and control technology can be imposed uniformly upon coal operations in this country. Both acts provide strong enforcement mechanisms and citizen participation and oversight of such enforcement activities. One glaring defect in what might otherwise be long overdue regulation of AMD came to light when the EPA promulgated its final existing source BPT standards[93] and proposed new source performance standards.[94]

C. *The Environmental Protection Agency's Refusal To Apply Effluent Limitations Guidelines To All Coal Mine Point Sources*

Despite the clear statutory mandate of the FWPCA that all point source discharges should be regulated by EPA, there are, at present, several omissions in the effluent limitations guidelines and proposed new source performance standards that EPA has promulgated for

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and Safety Act, 30 U.S.C.A. § 801-961 (Supp. 1978), and can be promulgated only after obtaining the written consent of the head of the agency administering the Safety and Health Act (currently the United States Department of Labor).

92. *Id.* § 516(b)(12), 30 U.S.C.A. § 1266.

93. 42 Fed. Reg. 21,380 (1977).

94. 42 Fed. Reg. 46,932 (1977).

the coal mining point source category. These omissions consist of the failure to apply effluent limitation standards to point source discharges from inactive or abandoned surface or deep mining areas. Thus, while a mine must conform to EPA standards while coal is being extracted, once this process stops, or in the instance of surface mining, once regrading is completed,[95] there are currently no FWPCA requirements applicable. This regulatory gap is a significant omission representing a policy decision to omit from FWPCA coverage pollution point sources with potential for substantial environmental degradation. Under recently promulgated effluent limitation guidelines for existing mines[96] and the proposed new source performance standards[97] for new coal mines, a mine operator who has been pumping, treating and discharging thousands of gallons of acid waste water daily could close up, and face no continuing duty with respect to any future discharge under the national effluent guidelines or new source performance standards. Likewise, once the operator of a surface mine has finished regrading, his duty to treat waste discharges under its NPDES permit is terminated.

As a practical matter various state agencies may require continuing treatment or abatement of waste water discharge. This practical consideration is not dispositive of the issue of EPA's duty to promulgate standards for all point sources, particularly since the existence and continuance of effective state programs is in no way assured. EPA's failure to require treatment of post mining point source discharges is difficult to comprehend, especially in light of fairly clear statutory language,[98] legislative history[99] and judicial interpreta-

95. Thus, the EPA standard does not apply to surface mined areas which have been regraded but where no revegetation has taken place. Without revegetation a surface mined area is prone to heavy soil erosion and sedimentation of streams as well as surface water percolation through mined areas which will cause an increased formation of AMD.

96. 42 Fed. Reg. 21,380 (1977), 40 C.F.R. § 434 (1977).

97. 42 Fed. Reg. 46,392 (1977).

98. Section 301 of the Federal Water Pollution Control Act of 1972 (FWPCA), 33 U.S.C. § 1311 (1970) clearly requires that *all* point sources discharging pollutants be subject to effluent limitations.

99. "Subsection (b) [of § 301b] requires that *all* point sources of discharge of pollutants other than publicly owned treatment works, achieve . . . effluent limitations requiring the use of best practicable control technology currently available . . . ." (emphasis added) *Report of the House Committee on Public Works* in A LEGISLATIVE HISTORY OF THE WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972, prepared by the Environmental Policy Division of the Congressional Research Service of the Library of Congress (Committee Print, 1973).

tion[100] relating to EPA's duty to regulate point sources under the NPDES program.

It is clear that point source discharges are not only possible, but likely, both from inactive underground mines and from regraded but unrevegetated surface mines. The current regulations impose effluent limitations only to point source discharges from active operations. The reasons offered by EPA for this omission from coverage are neither clear nor particularly compelling, especially when viewed in the light of the clear evidence admitted by EPA that AMD from inactive or abandoned sites is potentially greater than that from active operations.[101]

In its summary of comments received on the proposed existing source regulations for the coal mine point source category, EPA acknowledged receiving comments on the issue of regulation of past mining but stated, "With respect to closed mines and abandoned mining areas the Agency does not intend to issue effluent limitations guidelines because regulation of such point sources is not amenable to production oriented effluent guidelines."[102]

The implications of this response raise several basic issues concerning EPA's view of their regulatory function and of their view of the coal mining industry. The issue of EPA's proper regulatory function centers on the fact that the agency's justification for not regulating ("not amenable to production oriented effluent guidelines")[103] is a completely unsupported administrative justification.[104] This type of administrative gloss on legislative mandates results in the circumvention of the lawmaking authority of the Congress.

Further, an examination of EPA's twenty thousand page rulemaking record discloses no discussion of just what the agency means by "production oriented effluent guidelines." Those effluent limita-

100. Natural Resources Defense Council v. Train, Inc., 510 F.2d 692, 710-11 (D.C. Cir. 1975) stated that effluent limitation guidelines should be promulgated for all point sources except those exceptional cases where categorization or classification is impossible.

101. 40 Fed. Reg. 48,832 (1975). "Mine drainage may continue indefinitely after all mining operations have ceased if proper mining methods, control technology and reclamation is not employed, or even increase in intensity after mine closure if proper mine drainage control technology is not employed." *Id.*

102. 42 Fed. Reg. 21,388 (1977). The proposed new source performance standards for coal mine industry repeat this omission. This may result not only in a failure to control post mining discharges from currently active mines but also may result in uncontrolled discharges from new mines years hence when they become inactive.

103. *Id.*

104. *See* authorities cited at notes 98-100 *supra*.

tions that are proposed in the regulations do not appear to be related to production, except that they apply only while production goes on; they are not based on amount of coal mined, pounds of pollutant per operating period, or any other production factor. As discussed earlier, water discharges from coal mines are not related to production; very little water is used in the mining of coal and it is more a nuisance to be eliminated than a material aspect of production.

The more basic issue revealed by EPA's position on post-mining discharge relates to the characterization of the scope of the coal mining industrial process. If, as EPA must maintain,[105] coal mining consists only of the extraction process, with the reclamation process not part of the industrial activity, then one might argue that it might be reasonable to limit coverage under effluent limitation guidelines and new source performance standards to the point where extraction stops. However, the surface mining laws of several states and the Federal government clearly view reclamation as an integral part of the industrial process.[106] Likewise, various regulations concerning deep mine closure indicate that the industrial process of coal mining extends beyond mere extraction.[107] Moreover, if internalization in environmental regulation is accepted as a fundamental policy it would seem logical to take a broad view of any extracting industry, which includes requiring mitigation of all environmental impacts to the greatest extent feasible.

In response to court challenges of the effluent limitation guidelines for the coal mining point source category, EPA has articulated its position on post-mining discharges more fully than it did in the comments appearing in the Federal Register, but not more satisfactorily from an environmental protection viewpoint.[108]

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105. On its face, EPA's rationale for failing to regulate post mining discharges is simply not comprehensible. Moreover, the author's review of the voluminous administrative record provides no clue to or support for its position. The argument posed on behalf of EPA in the text of this article is an attempt by the authors to make sense out of the bureaucratic confusion by viewing the agency's action in the most favorable light.

106. *See generally* Surface Mining Control and Reclamation Act of 1977, 30 U.S.C.A. § 1201-1328 (Supp. 1978), Bituminous Coal Open Pit Mining Act, PA. STAT. ANN. tit. 52, § 1396.1 (Purdon 1966 and Supp. 1978), West Virginia Surface Mining and Reclamation Act, W. VA. CODE §§ 20-6-1 - 20-6-32 (1970).

107. 25 Pa. Code § 99.12(3).

108. Consolidated Coal et al. v. Costle, Brief for Respondent EPA at 56-61, Nos. 76-1690, 76-1859, 76-1862, 76-1912, 76-1981, 76-1982, 76-2019, 76-2020, 76-2059, 76-2145, 76-2146, 76-2147, 76-1474, 76-1490, 77-1491, 77-1592, 77-1593, 77-1594, 77-1534, 77-1828, 77-1845, 77-1892, 77-1893, 77-1957, 77-1989, 77-1990, 77-2088 (4th Cir. 1977).

EPA takes the position that post-mining discharges are not regulated because 1) the agency does not have an adequate data base upon which to base national standards, 2) because the Federal Surface Mining and Reclamation Act of 1977 has provisions which can deal with this problem, and 3) because the omission of post-mining discharge standards will not prevent state agencies or EPA regional offices from imposing more stringent post-mining standards on a case by case basis through the NPDES permit program.[109]

The position that the failure to promulgate national post-mining discharge standards is somehow justified by the ability of individual states to impose this type of effluent control through the NPDES permit program raises two issues. The first issue results from EPA's recognition that post-mining discharges can be regulated. If this is the case, perhaps the EPA should regulate it. Moreover, if state agencies can evolve control strategies and impose control technology requirements, it would seem that these programs provide a viable measure of what BAT and BPT might in fact be for a particular industry.

A more fundamental problem raised by EPA's position that individual NPDES permits can be tailored to *address* the problem of discharges from post-mining point sources is that this approach abandons a substantial environmental hazard to the case by case approach, raising the very problems of forum shopping[110] and ineffective programs that the national standards of the 1972 amendments to the FWPCA were designed to eliminate.

> The decentralization of permit issuing authority envisioned by section 402 prompted concerns that industrial threats to relocate in areas where pollution controls were less restrictive would coerce states into adopting lax permit requirements. The effluent limitation guidelines contained in section 304(b) and the corresponding effluent limitations to be promulgated under section 310(b) were intended to safeguard against industrial pressures by establishing a uniform "minimal level of control imposed on all sources within a category or class."[111]

109. *Id.* at 56.

110. Forum shopping in this context does not refer to the practice of seeking access to a particular court to gain some advantage in litigation, but rather, a form of economic forum shopping in which industry strives to avoid unduly restrictive regulations.

111. Natural Resources Defense Council, Inc. v. Train, 510 F.2d 692, 709 (D.C. Cir. 1975).

Although forum shopping may or may not be particularly likely depending on the strength of the national economy, energy shortages and the like, in the case of coal resource development,[112] the additional costs associated with post-mining discharge control may result in a penalty in the form of higher prices for coal from states which strive to approach the AMD problem through regulation of discharges from inactive as well as active mines. Such comprehensive regulation of coal mine discharges in one state and lack of enforcement in another will provide a competitive price advantage for operators in the latter states and depress demand for coal development in the former. This sort of disincentive to effective pollution control should be eliminated by uniform standards wherever possible.

The second point argued by EPA is that the new federal Surface Mining Act shifts responsibility for control of water pollution problems to the Department of the Interior. Although the Federal Surface Mining and Reclamation Act of 1977 does indeed contain provisions relating to reclamation of surface mines, the surface effects of underground mining as well as standards regulating hydrologic impact of mining generally, this should not be a basis for EPA declining to exercise its full authority. The Surface Mining Act specifically provides that EPA's responsibilities under the FWPCA are in no way superceded by the Act.[113] Indeed, section 504(B) of the Act grants EPA a concurrence and veto power over any water quality regulation promulgated under the Surface Mining Act. Moreover, in a recent decision in which the interim regulations promulgated pursuant to the Surface Mining Act were challenged,[114] a federal court enjoined those surface mining regulations which imposed "stricter standards than those specifically set forth in the FWPCA program."[115] This decision explicitly affirms an institutional arrangement in which EPA takes the lead with respect to establishment of water quality standards for the coal mining industry.

The position that the Surface Mining Act will cover the issues of post-mining discharges and therefore EPA need not address them,

112. Obviously coal resources unlike other industrial facilities cannot be physically moved to another forum. The forum shopping referred to deals only with the economic considerations. *See* note 110 *supra.*

113. Surface Mining Control and Reclamation Act of 1977, § 702A, 30 U.S.C.A. § 1201 (Supp. 1978).

114. *Surface Mining Regulation Litigation,* 8 ELR 20,407 (No. 78-162 D.C. May 3, 1978).

115. *Id.* at 20,413.

misconstrues the legislative mandate to EPA contained in the FWPCA; Congress clearly desired the Agency to regulate all point source discharges, and to eliminate them completely by 1985. This misconception rests on the narrow view that effluent limitation guidelines should be limited to only certain types of technological applications, which do not include management practices as control technologies. EPA's third excuse for failing to regulate post-mining discharges is the lack of data. This assertion merits little comment except to note that at least one state has regulated post-mining discharges for almost a decade.[116]

EPA's responses indicate an evasion of the issue of post-mining discharges. This approach may be a result of agency politicing, particularly in the light of the administration's commitment to coal development, and the economic and labor problems of the coal industry. EPA may not want to vigorously pursue a program which might undercut administration priorities.

Perhaps a less cynical explanation rests on the physical nature of water use in the coal industry. Unlike virtually every other industrial point source EPA regulates, water in the coal industry is, for the most part, an impediment to production, and not an aspect of production. With respect to treatment and impact this distinction may have little significance. However, with respect to legal approaches to the regulation of coal mine discharges, this physical aspect may be the source of the controversy concerning post-mining discharges. EPA appears to have taken the position that comprehensive effluent guidelines and national standards cannot be applied to the coal mining industry under the NPDES program due to the variations in discharges based on geography, hydrology and other site specific characteristics.[117] Additionally, the fact that large portions of the discharge from coal mining take the form of area runoff or nonpoint source discharge seems to be used as a basis for minimimizing the use of effluent guidelines as a regulatory approach.[118] It might be logically argued that the availability of the

116. *See* Commonwealth v. Barnes and Tucker Co., 319 A.2d 871 (Pa. 1974), 371 A.2d 461 (Pa. 1977); Harman Coal Co. v. Commonwealth, 384 A.2d 289 (Pa. Commw. 1978).

117. Draft Memorandum, Economic and Political Implications for Mining Effluent Control Strategies from Gail Coad, Economics Analysis Division, U.S. EPA, to Dave Green, Aug. 7, 1975.

118. In an amicus curia brief filed by EPA in the appeal to the 5th Circuit of the decision in Sierra Club v. Abston Construction Co., Inc., 10 ERC 1416 (N.D. Ala. May 19, 1977), EPA argues that the legislative history of FWPCA indicates that coal mines can give rise to point

best management practice technique of pollution control under the Section 208 area-wide planning provisions of the FWPCA offers a higher degree of flexibility in discharge standards than do national effluent guideline standards.[119]

Unfortunately, the record of Section 208 implementation has been poor. Additionally, the existence of some non-point source discharges from mining areas should not be a basis for declining to regulate those point source discharges that do exist. Moreover, it is not clear that as a legal matter the more flexible best management practice approaches could not be incorporated into the BAT or BPT standards of the effluent limitations guidelines, thus providing the requisite flexibility to regulate all mining point source discharges. The best management practice standard provides a legal framework into which some of the less traditional control technologies of coal mining, such as revegetation and down dip drift mining, could be incorporated more readily.

The experience of Pennsylvania in regulating post-mining discharges from underground mines is relevant to this discussion. This state's approach to regulation of post-mining and discharge is illustrated in the decisions of the Supreme Court of Pennsylvania in its 1974 and 1977 opinions in *Commonwealth v. Barnes and Tucker Co.*[120] The facts and issues raised in that case indicate that post-mining discharges can be a significant environmental hazard and the regulatory authority can be designed to abate such discharges.

In *Barnes and Tucker* an AMD gravity discharge of 7.2 million gallons a day (mgd) flowed from an inactive underground mine. The mining operation itself had apparently been conducted in compliance with all applicable law but had ceased the year prior to institution of legal action. The Commonwealth brought an action to abate the discharge on several grounds, including statutory nuisance under Section 3 of the Pennsylvania Clean Streams Law and common law nuisance. After extensive litigation, the Supreme Court of

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sources of pollution discharge, and that the only relevant inquiry with respect to such point source is whether pollutants were collected or channeled into any "discernible, continued, and discrete conveyances" from where they reached navigable waters. EPA further argues that there is no statutory support for a requirement that some "affirmative act" defined a point source. This position seems very close to contradicting the "not amenable to production oriented effluent guidelines" position of EPA.

119. *Id.*

120. 319 A.2d 781 (Pa. 1974), 371 A.2d 461 (Pa. 1977) [hereinafter cited as *Barnes & Tucker I and II*].

Pennsylvania ruled that the Commonwealth was entitled to an injunction which would require the company to pump and treat the discharge. The cost of this treatment was estimated to be between thirty and fifty thousand dollars a month. The length of time treatment may be necessary is subject to conjecture. Since the outside estimate is several hundred years, this type of burden appears relatively heavy. In fact, the coal company argued on a petition for certiorari to the Supreme Court of the United States that this amounted to an uncompensated taking of private property and thus the state action violated due process. Their writ, however, was denied by the Supreme Court.[121] A contrasting view of the imposition of the duty to treat post-mining discharges is that such a duty is reasonable in the light of the public interest in unpolluted water. Moreover, it is only through the technique of imposing liability that the incentive to research and develop technologies to solve environmental problems is created. This technology forcing approach is a basic premise of the FWPCA.[122] The two stage effluent limitation scheme and the 1985 zero discharge goal amount to an announcement that industry must apply itself to solving its waste water problems within a specific time frame.

The *Barnes and Tucker* decisions and the Pennsylvania approach to regulating post-mining discharges have addressed the fundamental legal issues of post-mining regulation that seem implicit in EPA's failure to regulate post-mining discharges. These are the issues of due process raised by requiring treatment when no current activity on the part of the operator is causing the discharge, such as "non-production oriented discharges."

The *Barnes and Tucker* decisions affirm the view that constitutional objections to such regulation as "takings" must be viewed in the light of the reasonableness of the exercise of the police power. The taking issue has several nuances with respect to post-mining discharge control. The first of these relates simply to the cost of abating such discharges in general, especially in the light of the lack of any present activity by the operator with respect to the discharge. Such discharges stem from the nature of mining; but for the prior

121. *See* Brief for Appellant, Barnes & Tucker Co. v. Pennsylvania, No. 74-44, *appeal dismissed*, 434 U.S. 807 (1977).

122. Environmental Policy Division, Congressional Research Service, Library of Congress, *A Legislative History of the Water Pollution Control Act Amendments of 1972* Serial No. 93-1 at 170 (1973).

(profitable) activity there would be no discharge. Thus the operator's activity created a condition deemed offensive to the public welfare, and abatement is justified.[123]

The second aspect of the taking issue relates to discharges resulting from adjacent mines. Evidence in the case indicated that 83% of the discharge Barnes and Tucker was required to treat flowed into the mine from adjacent active and abandoned mines.[124]

The court did not hesitate in imposing liability for this type of discharge on the same police power basis as would justify regulation of any discharge, again employing a *sine qua non* type rationale with respect to prior mining activity. The imposition of liability for discharges from adjacent mines that flow through the operator's mine may entail substantial expense. A more common approach to liability for waste discharges from active mines is the "base waste load" amount in which liability for treatment is apportioned among the sources regardless of the final discharge point. Under this view Barnes and Tucker would be required to assume the costs of treating only 17% of the total discharges.

This approach was rejected by the Pennsylvania courts in *Commonwealth v. Pittsburgh and Hamar Coal Cos.*[125] with respect to apportioning treatment liability for discharges from an active mine which originated in adjacent mines. The rationale of the *Pittsburgh/Hamar* decision is related to the necessity of pumping and discharging water that accumulates in the active portion of a mining operation. If pumping and discharge did not take place, the underground mine workings of the active mine would soon be inundated. Clearly this was a more direct causal relationship to profit-making activity than in the inactive gravity discharge situation of *Barnes and Tucker.*

A more equitable approach to the issue of apportioning liability for waste water discharges from mines would be to initially place liability upon the discharger, but to allow the discharger to demonstrate that a portion of the discharge is a result of some other mining activity. To the extent that alternative sources can be identified either in terms of quantity or quality of discharge, the treatment costs could be apportioned if adjacent mines can be identified as contributing to the generation of acid water discharged from a point

123. *See Barnes & Tucker II, supra* note 120, at 467.

124. *Id.* at 465.

125. 452 Pa. 77, 306 A.2d 308 (1974), *appeal dismissed,* 415 U.S. 903 (1974).

source. Discharge permits could be structured so that waste water transports into other areas would be specified and a duty to indemnify the ultimate discharge treater could be imposed as a permit condition. This approach would ensure that discharges are treated, that each mine pay its costs regardless of incidental aspects of geotopography, and that coal recovery is enhanced by avoiding disincentives for extraction of coal based solely upon potential discharges.

V. Conclusion

AMD and coal mining in much of the Eastern United States have long been synonomous. For a century AMD has drained into and destroyed thousands of miles of our waterways. AMD has not only damaged the natural beauty of the Appalachian region; it has also lowered the quality of life. Sterile, yellow-orange stained streams have attracted neither tourists nor spurred industrial development.

In the past, the AMD albatross has hung heavily around the Appalachian region as a symbol of depression, and despair. It can no longer be claimed that there is no effective means to deal with the problem. Technology exists which can abate AMD. The law now clearly compels treatment and abatement. If even one more mile of Appalachian stream is subjected to centuries of AMD pollution, the responsibility must rest squarely on the shoulders of those governmental officials charged with protecting our environment and upon the coal industry which has for so long turned a deaf ear to the complaints of its Appalachian neighbors.